

SCIENCE

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THE ABSENCE OF AIR FROM THE MOON

BY SIR ROBERT BALL, LOWNDSEAN PROFESSOR AT CAMBRIDGE, ENGLAND.

ASTRONOMERS have long felt that the absence of air from the moon is a fact that demands some special explanation. Most of the globes in space which are known to us are encompassed by more or less copious atmospheres, why then is the moon an exception? why should there be a gaseous investment to the earth and to Venus, to Mars and to Jupiter, and why should the moon alone be devoid of such covering? The sun and other stars are also so very copiously endowed with gaseous surroundings that the total want of anything of the kind from the moon becomes all the more enigmatical.

At last a light has been thrown on the matter, and an explanation is now provided which is so consonant with the present state of physical knowledge, that I cannot hesitate to accept it. The absence of air from the moon is a necessary consequence of the kinetic theory of gases.

According to the principles of this theory, now generally accepted among physicists, any gas such as oxygen or hydrogen, is composed of molecules which move with an extreme degree of rapidity. The molecules of hydrogen, for instance, which are the most nimble of all the gases in their movements at ordinary temperatures, dash along so fast as to travel on the average somewhat more than 6,000 feet a second. Oxygen and nitrogen have movements which are generally much less than those of hydrogen. But it is to be noted that, in the course of their movements, individual molecules frequently attain velocities very much in excess of the average pace. This is the important point for our present purpose, for on it depends the explanation of the phenomenon of which we are in search.

It can be shown that the mass and the dimensions of the moon are such that if a body were projected upwards from its surface at a pace, let us say, of half a mile a second, that body would ascend to a very considerable elevation, ultimately, however, the attraction of the moon would overcome its outward movement, and the body would tumble back again. If, however, the initial pace were so much greater that it attained a certain critical amount of about a mile a second, then the missile, according to the laws of motion, would ascend from the surface of the moon and go on and on never to be again re-called by any power that the moon's attraction could put forth.

Let us suppose that the moon were now to be invested with a new atmosphere of oxygen or nitrogen. The molecules of these gases will, of course, be darting about with the velocities appropriate to their nature, but, generally speaking, the speeds with which they are animated remain within the limits of velocity which it is in the power of the moon to control. But these are only the average speeds, and it will frequently happen that individual molecules will be animated by a speed equalling or exceeding the critical pace of a mile a second; if this takes place at the upper layers of the moon's atmosphere, the little molecules will take leave of the moon altogether. Other particles follow in the same fashion, and thus it happens that an atmosphere composed of such gases as these we know could not permanently abide on the moon.

On the earth we have and we retain a copious atmosphere. The reason simply is that the earth is massive enough to require that a projectile shall attain a speed of about six miles a second before it goes off and takes leave of our globe. This velocity it would seem that the molecules of oxygen and nitrogen do not

generally or ever reach. Hence it is that while the earth can retain the atmosphere with which it was endowed, the moon is unable to do likewise.

SOME ERRORS IN THERMOMETER READINGS.

BY FRANK WALDO, PRINCETON, N. J.

I HAVE understood that the long-awaited comparison of ordinary thermometers with the gas thermometer, at very low temperatures, has been carried out at the International Bureau of Weights and Measures at Sevres. However, I have been unable to get hold of any account of this work, as the official reports concerning it had not been received a short time ago even at the Weather Bureau Library. In Wild's *Repertorium für Meteorologie*, Vol. XV., which has just been received, there is an account of some careful comparisons at low temperatures, which gives results probably not very different from those obtained at Sevres; and a little summary of this will undoubtedly be of interest to some readers. In the St. Petersburg paper,¹ S. Hlasek gives a little summary of the condition of the thermometric standards of the Russian Meteorological Service from the time Director Wild took charge (about 1868) up to the present time. In the present communication, I will not trace through the various thermometer corrections as given by Hlasek, but will merely give the latest results, showing the corrections to be applied to the standard mercurial thermometer at moderate and low temperatures and to the standard spirit thermometer at very low temperatures, to reduce them to the hydrogen gas thermometer, which is the international standard.

Correction of the spirit thermometer by Geissler.		Correction of the standard mercurial thermometer, Geissler No. 10.	
At	Correction.	At	Correction.
— 5° C.	— 0.56° C.	40° C.	— 0.16° C.
— 10	— 0.72	35	— 0.16
— 15	— 0.90	30	— 0.16
— 20	— 1.10	25	— 0.15
— 25	— 1.36	20	— 0.13
— 30	— 1.68	15	— 0.11
— 35	— 1.95	10	— 0.08
— 40	— 2.23	5	— 0.05
— 45	— 2.47	0	0.00
— 50	— 2.72	— 5	+ 0.02
— 55	— 2.95	— 10	+ 0.07
— 60	— 3.15	— 15	+ 0.13
		— 20	+ 0.22
		— 25	+ 0.27
		— 30	+ 0.25
		— 35	+ 0.31
		— 40	+ 0.36

A zero-point correction of + 0.39° C. has been applied in assigning these corrections.

These corrections were obtained by means of a normal (Toluène) thermometer, Tonnelot No. 4932, which had been compared with the hydrogen gas thermometer at Sevres.

¹ Die Temperatur-scalen des Physikal. Cent. Observ. und ihr Verhältniss zu der international Temperatur-scale, 1892.

Since January, 1892, all of the thermometers verified at the Central Physical Observatory at St. Petersburg have been referred to the hydrogen gas thermometer at Sevres as a standard.

The thermometers verified between January, 1877, and January, 1892, require the following (additional) corrections, in order to reduce their readings to this standard:—

Temperature.	Correction of the mercurial thermometers.	Correction of the spirit thermometers.
+ 40° C.	— 0.16° C.	— 0.2° C.
+ 35	— 0.16	— 0.2
+ 30	— 0.15	— 0.2
+ 25	— 0.14	— 0.1
+ 20	— 0.12	— 0.1
+ 15	— 0.09	— 0.1
+ 10	— 0.07	— 0.1
+ 5	— 0.04	0.0
0	0.00	0.0
— 5	— 0.03	0.0
— 10	— 0.02	0.0
— 15	0.00	0.0
— 20	+ 0.01	0.0
— 25	+ 0.06	— 0.3
— 30	+ 0.07	— 0.6
— 35	+ 0.14	— 0.8
— 40	+ 0.25	— 1.1
— 45	—	— 1.4
— 50	—	— 1.6
— 55	—	— 1.8
— 60 C.	—	— 2.0

I wish also to mention the differential thermometer corrections described by Leyst in Wild's *Repertorium für Meteorologie*, Band. XIV., in which the temperature of the thread of mercury, when read, is different from that of the bulb, to which it is referred. Two cases are cited. 1. For a maximum thermometer, with separated thread (as, for instance, the Negretti and Zambra form), the thermometer is read at a different temperature from that at the time of maximum temperature, when the separation took place. For the ground-surface temperature at Nukuss, Leyst finds for a summer day a correction of + 0.73° C., and that for the average of three summer months a correction of + 0.51° C. must be applied to counteract this error. For the air temperatures the corrections ranged from + 0.10° C. to + 0.20° C. in the cases cited by Leyst. 2. The temperature of the thread of mercury and that of the bulb is not the same in the case of the wet-bulb thermometer, when the difference in the temperatures of the wet- and dry-bulb thermometers does not vanish. Ordinarily, the thread is warmer than the mercury in the bulb. At a temperature of 30° C., and a humidity of 50 per cent, there was a correction of — 0.30° C., which means, for this case, an error of 0.5 millimeters in the absolute humidity, and of 2 per cent in the relative humidity.

TO ANTHROPOLOGISTS.

DEPARTMENT M of the World's Columbian Exposition includes all subdivisions of anthropology and history, although generally known as the "Department of Ethnology."

The anthropological portion of the department is subdivided into the following principal sections:

1. The Ethnographical Exhibition of Native American Peoples. The representatives of these peoples will be living in their native habitations on the grounds set apart for the purpose along the eastern shore of the Lagoon immediately north of the Anthropological Building.
2. The general Ethnological Exhibit in the building.
3. The general Archæological Exhibit in the building, and the casts of the several portions of the ancient ruins of Yucatan on the grounds in front of the main northern entrance to the Anthropological Building.
4. The general Exhibit of Ancient Religions, Games, and Folk-lore.
5. The Anthropological Laboratories on the northern gallery

of the building. These laboratories will include special rooms devoted to physical anthropology, criminal anthropology, psychology, and neurology, and will be furnished with instruments and apparatus used in research, which will be carried on during the Exposition. The laboratories will also contain diagrams, charts, and tables illustrating various researches, particularly those relating to the physical characteristics of the native American peoples, and the comparison of the same with other races. There will also be diagrams illustrating the physical characteristics and the mental and physical development of school children in North America.

6. An Anthropological library covering all subdivisions of anthropology and allied sciences. For the purpose of making this library as perfect as possible and to enable students and educators to become acquainted with the mass of literature upon the subject, it is expected that authors, societies, museums, and publishers will contribute their books and papers relating to anthropology or any of its subdivisions, such as archæology, physical anthropology, psychology, neurology, ethnology, ethnography, primitive and ancient religions, myths, legends, folk-lore, languages, primitive art, primitive manufactures, etc., etc. The transactions, memoirs, journals, and proceedings of anthropological, ethnological, and archæological societies and museums, and the special papers ("reprints," "separata") of authors, are particularly desirable. There will be printed as soon as possible a full subject and author catalogue of the library. This catalogue will receive a wide circulation, and as it is intended that it shall be a reference catalogue for students and libraries, the publisher and price of each book and paper known to be for sale in any country will be given. The library will be carefully and properly arranged in book-cases in the room devoted to it, and will be under the special charge of assistants of the department, who will permit the volumes and papers to be referred to in the room and will give information as to their price and how to obtain them of agents, societies, and publishers. It will thus be seen that it is the intention to make known through this library the works of all writers upon anthropology so far as possible and that thousands of persons specially or cursorily interested in the subject will have an unrivalled opportunity of finding just the books and papers they wish to obtain.

The library will, after the close of the Exposition, be placed in the permanent Memorial Museum of Science, which is to be established in Chicago. It is therefore particularly requested that each contribution be sent to the Anthropological Library with a presentation slip stating that it is presented to the Columbus Memorial Museum, and the same will be duly acknowledged by the proper authorities when placed in the Museum Library after the close of the Exposition. In cases that may occur when contributions to the library are sent for use during the Exposition only, all such books or papers must be distinctly indicated by the words "to be returned" written over the name and address of the owner or sender, and all so marked will be returned free of expense at the close of the Exposition. Every book and paper should be marked with the name and postoffice address of the sender. The books and papers should be sent by mail unless too bulky, in which case by express and should be addressed, World's Columbian Exposition, Department M, Anthropological Building, Chicago, Ill.

GOLDSMITHS INSTITUTE ENGINEERING SOCIETY.

SIR FREDERICK BRAMWELL'S PRESIDENTIAL ADDRESS.

AT the opening meeting of the session of the above society the president gave his inaugural address. Mr. Lincham occupied the chair, and, after an introduction, Sir Frederick said:—

Mr. Lincham, ladies, and gentlemen: I am much flattered at being selected as president of the Goldsmiths Institute Engineering Society. I am an old member of the Goldsmiths Company having been connected with it some fifty years, and am a past prime-warden. I have to congratulate you upon the progress you have made, and am informed that, though your society has been in existence but a few months, you now number over 100 members. You have two principal objects in view, one of which only

has been pursued up to the present, viz., the visiting of engineering works, in which you were accompanied by Mr. Lincham, who has explained that which you were witnessing, a point of very great advantage to yourselves. I may say here that I think you are very highly indebted to the head of Section A for his valuable suggestion in starting the society. That during the season you have visited such places as the Arsenal, the Hydraulic Power Company at Wapping, the Tower Bridge, Messrs. Simpsons' Loam Moulding, Messrs. Penn, Maudslay, the Deptford and City Electric Lighting Stations, and one steamboat, the "Dunnotar Castle."

Henceforth you are not only to continue this branch of your study, but you propose to prepare papers for reading and discussion, and to obtain the friendly services of persons competent to lecture upon engineering and cognate subjects. Now I find great difficulty in addressing you. I need not enlarge upon the importance of engineering; your presence shows you appreciate that. I hardly like to give you history, although within my own active work since my apprenticeship there has been so great a change, in mechanical engineering especially, as to afford me means for an ample chronicle.

Perhaps I may be pardoned for alluding to my early work-shop days. There were then no railways to and from the city; the Greenwich Railway was only under consideration. Most engines used steam of no more than 3 pounds pressure. There was no planing machine, no slide lathe. If an engine-crank had to be turned, the pin was tooled first, and then the shaft afterwards, by means of a hanging tool, and the throw was much what it pleased Providence to make it, so that in a double-cylinder engine it frequently happened that the two throws were not exactly the same. Boilers were fed by a feed-head, and if the pressure became greater than three pounds, the water was ejected, and thus became a sort of safety-valve.

The notions regarding steam pressure were very vague. I have a great regard for a very interesting old book, "*Belidor's Architecture Hydraulique*," in which I read of a boiler, erected in France, having a heavy superstructure to keep down the pressure, and much the same construction was used in the boiler at York Rd., Charing Cross, which supplied London with water. Sir William Siemens used to say that this load of masonry was clearly for the purpose of providing a large number of missiles in case of an explosion. When quite a child I was taken by my nurse to see the water-wheels at London Bridge, which were also used for the water-supply, and even at that early date engineering had a great fascination for me. Everything then was different. The opportunities for technical learning, other than those from apprenticeship, were simply nil; that is now quite changed. This institute is sufficient to show it. You may learn and learn well, and it would be to your eternal shame if you did not; but I want you, in the pride of your strength, not to deal hardly with the older hands, but to remember that, though they had not the advantages, they made the progress, and must have had very much in them to do this when we consider their resources. One great advantage of instruction in principles is this — aspiring inventors need not attempt impossibilities. Suppose a man were to say, "I have a machine that will produce marvellous results if you will concede for its purposes that two and two make five, as I say they do." His friends would probably call in a doctor or conduct him to a lunatic asylum. But this method of stating the case is not so very absurd. Much labor has been spent on inventions, which were impossible, but where, from want of instruction, the impossibility did not make itself apparent — where the two and two could not easily be seen, which it was endeavored to make into five. The learning of the principles of mechanics will show that you cannot get more work out of a machine than you put into it, and will thus put a stop to useless inventions. Let us consider the connection of the past with the present by the great examples of progress. Boiler pressure has increased from three pounds to 150 pounds, and these pressures have been utilized by engines of continually increased expansion with single, compound, and triple cylinders. The triumphant position of the steam-jacket, though many times questioned, is worth noting. First used by Watt, he does not appear to have been aware of the principle

involved. Forced draught, by which I mean a closed stoke-hold (not the closed ash-pit, which is very old); very curiously this adjunct to marine propulsion was seen by me at work in the United States as long ago as 1853. I spoke of it on my return, but no attention was paid to it until the principle found application in torpedo boats. I will read from my note-book for 1853: —

"Oct 11, 1853. Camden and Amboy railway steamer 'Richard Stockton.' Tonnage 651. Two boilers on each after sponson, machinery made in 1852 by Haslem (?) and Hollingsworth, Wilmington, Delaware. Wheels 22 feet in diameter, 9 feet wide. Boiler $\frac{7}{8}$ of an inch thick, proved to 55 pounds, to work at 39. Actual pressure 25 pounds. Boilers have two fire-places in each; they burn anthracite coal; each one has a powerful donkey working a blower, which is on deck, and which blows into the boiler-room, the door being kept shut, and the stoker under pressure." The object of the arrangement was to prevent a tongue of flame coming from the fire in case the door should be left unlatched.

Large steamers were constructed on most unsatisfactory principles in the early days. Nothing could have been more unlike a box girder or braced structure than the wooden built ships, but the present double bottoms and iron decks form probably as good specimens of girders as can be made, competent to carry, without straining, their own weight and that of their cargoes, while the points of support are changed at every movement by the force of the waves. I may mention also the great advances in the speed of ocean steamers, and wish I had time to describe carefully to you how much we owe to the late Mr. William Froude, who, by means of his admirable paraffin models, showed how to predict with absolute accuracy the performance of the full-sized vessel. The material employed was very easily worked, and could be remelted for further models.

Another great feature in the engineering of to-day is that of making subterranean communications by means of tunnelling with the aid of shields and compressed air. The Thames tunnel was the earliest of these great works, and the shield was in several sections, so that each could be advanced separately by a screw-jack, but there was no compressed air and the difficulties were very great, for in some places an artificial soil had to be constructed by tipping in clay. I was shown these works when in progress by the eldest Brunel. Compressed air was introduced by Sir Thomas Cochrane (afterwards Earl Dundonald), who took out a patent in 1830 (No. 6018). I knew him very well; he was a clever engineer, but, not being trained, he sometimes made mistakes in detail. His patent was for "Excavating, sinking, and mining," and included "an apparatus for compressing atmospheric air into subterranean excavations, so that its elasticity may counteract the tendency of superincumbent water or moist earth to fill such excavations," and he refers to "the undertaking which is now executing beneath the river Thames at Rotherhithe."

Now let me say a few words about electricity and its present condition. Faraday was the great author, and to him we owe the science of electrical engineering, although his discoveries have been considerably developed by many other great workers, whose names are legion, one of the greatest of these being my late valued friend, Sir William Siemens, who, though he died some eight years ago, I cannot now mention without bitter regret. You have often been told that a little learning is a dangerous thing. This is a great mistake. Learn all you can; it is only a shallow knowledge of everything as your end and aim that is wrong. Sir William Siemens used to say, "Learn one thing thoroughly, and after that a little of everything." The development of practical electricity began with the telegraph, and I remember how astonished we all were when a murderer was captured by its aid; but telegraphy is fast giving way to telephony. Electric arc-lighting was first shown at the Exhibition of 1862, applied to light-houses. Since then it has been much further developed, but the incandescent system of Edison and Swan is, after all, the most useful extension of electric lighting. I do not want to introduce political economy, but when the advance or hindrance of engineering is due to parliamentary interference, the science deserves your study. Several years ago, when the time was ripe for general electric lighting, Mr. Joseph Chamber-

lain, then president of the Board of Trade, introduced an act to enable electric lighting companies to be formed, but, at the same time, provided that city authorities might buy up their concerns at the end of twenty-one years at the mere cost of the material; while, should they not be then pleased to use their right, it should occur again at the end of every seven years. Only recently a change was made, on the discovery that the act was a direct hindrance to speculation, for in effect it meant, "We will let you run the risk when the scheme is not paying, but will take it as soon as you have made it successful." The vicious principle is still retained, but the same has been extended from 21 to 42 years. The result I need hardly tell you. You see it in the general installation of electricity throughout the metropolis, and electric principles I hardly need describe to you. The dynamo gives a continuous low tension current, using, in its simplest form, two wires for its transmission, but the three-wire system is one of the most remarkable advances. A high-tension current traverses the mains, and is transformed to low-tension when entering the houses, the saving in copper being thereby enormous, while, by a switch arrangement, we can use the current at will for lighting or for power. But you yourselves saw the largest and most interesting example of this method of distribution when you visited the Deptford generating station of the London Company.

Electric welding is another application of primary importance, using either the two plates themselves as poles, or one plate as pole, and what we might call a "soldering bit" for the other pole. This method is extensively employed at Sheffield for repairing steel castings, and with great success. When I was apprenticed, there was used for similar purposes a metal known as "Beau Montague" (laughter), and from your faces I gather it has not been entirely forgotten. It was not a method of repairing, however, only one of deceiving. I wish I had time to tell you of present-day steel manufacture, but I will simply say that, whereas it was formerly made in pounds, it is now produced in hundreds of tons.

I am now about to extol myself. The Gifford injector caused very great interest from the first, if only because its action seemed impossible of comprehension. I was myself the first to give a complete explanation of that action without the aid of mathematics. (Hear, hear). My contention was that the whole thing might be summed up in the single word "concentration," and to show this I devised an arrangement by which a head of water left one vessel and entered another, rising almost to the same height, by simply shaping the opposite nozzles with such care as to concentrate the pressure upon the smallest possible area. A similar example is that of an armor-piercing projectile. A blunt-ended shot will be flattened still further, but a hard-pointed one will receive very little deformation in entering the plate.

To close with a few remarks on technical education. For the first eight years of its existence I was chairman of the executive committee of the City and Guilds of London Institution. I am now a vice-president, but have not time to take an active share in the management. I am glad, however, to know of the good that it is doing and of its recognition of merit in those which go up for examination. I am glad to find that, even in this very early period of the existence of your society, Mr. Walter Grant has succeeded in obtaining the bronze medal of the Institute and third position in the country for mechanical engineering, while the same student has obtained a Queen's prize in advanced machine drawing, which is granted, I am told, to only a few top men. (Loud cheers). I have some further notes placed in my hand with regard to the success of other students of Section A, from which I find that in three advanced subjects (steam, mechanics, and machine drawing) there has only been one failure in each, equivalent to 12 per cent, while the grand total of all its subjects represents a success of 82 per cent, a result of a very gratifying character, which is greatly due to the excellent instruction which Mr. Lincham has given you. (Loud and continued applause.)

A vote of thanks was next proposed by Mr. Redmayne, which was carried unanimously.

Sir Frederick briefly tendered his thanks, and the proceedings terminated.

ON THE GROWTH OF THE RATTLE OF CROTALIDÆ.

BY S. GARMAN, MUS. COMP. ZOOL., CAMBRIDGE, MASS.

SINCE the appearance of the article on "The Rattle of the Rattlesnakes" and its evolution, Bull. Mus. Comp. Zool., XIII., No. 10, Aug., 1888, the study of these crotalidæ has been continued with the purpose of securing rates of growth and other particulars not fully determined at the time of publication. As the final report may be delayed for a time it seems proper in this place to refer in advance to several items which have in some extent been questioned by other writers. The point to which attention is specially directed is the acquisition of new joints in the rattle. In regard to this, variations occur in the time; none have been noticed in the method. In all cases observed the growth of a new button, causing the appearance of a new ring or joint, was connected with the process of sloughing. Growth was first detected at the time of the advent of the whiteness in the eye and under the epiderm in general. This whiteness was evidence of dermal growth, which on the tail seemingly was prolonged a little after the eye had become clear or until the slough was cast. Possibly the apparent prolongation was due to a mere pushing back and hardening of the newly-grown button. The preparation for sloughing was in each instance preceded by the whitish appearance under the outer cuticle, as was stated in the above-mentioned bulletin. The milkiness, as it might be called, lasted longer on specimens kept in the shade than on others exposed to the sunshine.

A few extracts from notes on several individuals will, without further comment, suggest the results obtained.

The first case is that of a large banded rattlesnake, *Crotalus horridus*, on which the whiteness was visible on eye and button August 17. There was no mistaking the fact that the epiderm of the button was being pushed back to become a section of the looser portion of the rattle. By the 26th of the month the button was becoming darker, though the eye was still somewhat clouded and remained so until the 30th. At this date the eye was bright and clear and the new button had become dark colored and was seen to have pushed back the recent slough as the newest ring or joint of the series. It was not until September 4 that the slough was stripped from the body; it had previously separated from the new ring.

Another case is that of a prairie rattler, *Massasauga, Sistrurus catenatus*, on which the milky appearance was seen September 12. It was then but slight on either eye or button. Two days later it was very intense; by the 19th of the month it had become almost obsolete. Only about half of the new button was visible behind the small scales at that date. This snake sloughed on the 24th. The newly exposed button was whitish; it became dark rapidly when placed in the sunshine.

A third case to mention is that of a snake, of the same species as the latter, kept on very short allowance of food, by which no doubt sloughing was much retarded. This one did not show the milkiness until December 11. The whiteness vanished about the 23d, and the slough was put aside on the 31st. It came off nearly entire, the exception being less than half an inch, which remained attached to the anterior edge of the newest ring.

In all cases under observation a new ring has been gained with each sloughing, whether it occurred in the fall, the winter, or the spring. The snakes are still in keeping to determine the greatest number of sloughs in a season and other points. Thus far the later studies have given very little reason indeed for modifying the conclusions published in the above-mentioned article.

CURRENT NOTES ON ANTHROPOLOGY.—XXIII.

[Edited by D. G. Brinton, M.D., LL.D.]

The Language of Craniology.

"SPHENOCEPHALIC, tetragonic, dolicho-meso-brachycephalic, hypsicephalic, metrio-cephalic, hypo-stegobregmatic, hypsionchobregmatic, cremnooipistocranic, chamelnogathic, euryzicic, chameprosopic, platyrrhine, chameconch, orthognathic, hyperplatopic"!.

In these few and simple words Professor Sergi, the distinguished Italian craniologist, describes a skull from Melanesia. It offers a by no means unexampled specimen of the extraordinary language which writers of that specialty have been revelling in of recent years. They seem to have swallowed the Greek dictionary, and finding its roots of difficult digestion, have regurgitated them in this unassimilable state. Let us appeal to them in the words of Horatio when he listened to the dialogue between Hamlet and Oscar:—

"Is't not possible to understand in another tongue? You will do't, sirs, really."

To make matters worse, a Greek root which satisfies a German, is for that very reason distasteful to a Frenchman. It is enough for one to say *chamaeconch*, for the other to invent *megaseme*. Even German big-wigism has at last revolted against this distressing verbosity. Professor Moritz Benedikt, of Vienna, has published an open letter appealing to craniologists to speak in some less jaw-breaking and pedantic lingo. He addresses it to Professor Sergi, and publishes it in the *Proceedings of the Vienna Anthropological Society*, December, 1892. May his protest have a wide circulation, and receive an attentive hearing!

Ethnography of Tribes of the Northwest Coast.

Several interesting contributions to our knowledge of the tribes of the Northwest coast have recently appeared. First may be mentioned the report on the Kootenay Indians of south-eastern British Columbia, by Dr. A. F. Chamberlain, published with an introduction by Mr. Horatio Hale by the British Association for the Advancement of Science. It deals quite fully with their psychology, social organization, arts, physical characteristics, and language. In the last-mentioned respect they appear to form an independent stock. In the introduction, Mr. Hale discusses some general questions with his customary ability and fairness.

A neighboring tribe, the Shuswap of British Columbia, forms the subject of a careful paper in the *Transactions of the Royal Society of Canada* by Dr. George M. Dawson. He speaks of their tribal subdivisions, houses, customs, history, and mythology, and adds a long list of place-names with their significations. An excellent map is appended. He agrees with previous writers that their linguistic affiliations are with the Salish proper; but he calls attention to an ancient speech among them, now nearly extinct, apparently from some Tinné influence.

In the same *Transactions*, Mr. Alexander Mackenzie publishes descriptive notes on implements, weapons, and tools of native manufacture from Queen Charlotte's Island, with illustrations. In an introductory note Dr. G. M. Dawson extols the ability and dexterity of the Haida Indians, which he thinks have not been appreciated by ethnologists. He does not hesitate to claim that the incipient civilization of the Haidas "was higher than that found in any other people of the west coast of North America"; a statement which certainly requires modification.

Points in African Linguistics.

The precise relationship of the various members of the Nuba stock in equatorial Africa has recently led to some discussion in German periodicals. The Nuba stock is not negritic. The features and expression of the face, the shape of the nose, the forms of the skull, place them outside the physical characters of the true Negroes, and assimilate them in spite of their dark color to certain branches of the white race, especially the Semitic. In languages they appear to offer four independent families, one of which includes the Monbuttu, the Nyam-nyam, the Gola, and some others, the credit of defining which belongs to Dr. Friedrich Müller of Vienna, as has been shown in a late contest on the point. The intermediate physical position of this stock lends especial interest to its study.

An important warning in reference to the Bantu languages was sounded at the last meeting of the American Oriental Society by the Rev. Lewis Grout, of Vermont. He points out that the "Comparative Grammar of the South African Bantu Languages," of the Rev. J. Torrend, lately issued in London, takes as its standard the tongue of Tonga or Batonga, which is unquestionably a corrupt and mixed dialect, with many borrowed words and

broken-down grammatical forms. Mr. Grout touches here upon a very important point in linguistic study. In approaching the analysis of an indigenous tongue it is extremely difficult to decide which of its dialects should be chosen as the standard — as best representing the parentstock. Yet it is most desirable, essential, indeed, to a successful analysis, that the right choice be made.

On Current Mexican Philology.

It is probable that no more independent linguistic stocks will be discovered within the area of the Republic of Mexico; but there are many within its various states of which we lack information. Within the last few years energetic efforts have been made by the Director-General of statistics, Dr. Antonio Peñafiel, to supply this deficiency. He has caused to be extensively distributed a list of nearly three hundred words to the officials and curas of parishes where the native dialects continue to be spoken, with the request that they be translated into the local idiom and returned. In this manner he has obtained a mass of new and trustworthy material which will enable linguists to classify the many obscure and little-known tongues, the names of which are preserved in the works of Orozco y Berra, Pimentel, and other writers.

It is to be regretted that these lists have not been promptly published in some cheap, accurate, and convenient form. The only instance of an issue of this *Cuestionario Filológico* which I know of is the "Vocabulario Castellano y Nahuatl," by the licentiate Cecilio A. Robelo, which was printed by his own efforts at Cuernavaca. It is very much to be commended, and to call it a vocabulary is to do it scant justice. Each word is traced to its radical, its special uses and synonyms are discussed, and its various significations are explained. If all the *cuestionarios* are filled on this model, American philology will be enriched, indeed, by our Mexican friends.

The Tale Told by the Teeth.

The development of the molar teeth of the human jaw is a history which is claimed to reveal some interesting points in the genealogy of man and the relationship of races. It is now some five years since Professor Cope urged the opinion that the tubercular forms usual in the cusps of human molars point to a reversion to the type of dentition prevailing among the lemurs, and the inference was near at hand that in the discussion of the evolution of the genus *Homo* we had better look toward a lemurian rather than a simian progenitor.

His statements were studied closely by several German writers, and also by Dr. H. F. Osborn of Columbia College, who, in a recent number of the *Anatomischer Anzeiger* (No 24, 1892), presents a summary of results, some of the weightiest taken from his own researches. He shows that the primitive form of the mammalian molar was a single cone, to which all the other cusps have been successively added. Four, five, or six cusps, and various intermediate tubercles, appear on the molars of some of the primates. The tubercles of the human molar may be considered a reversion to the lemurine type, and Dr. Osborn maintains that in comparison the quadritubercular form was a comparatively recent acquisition compared to the tritubercular.

The attempted application of these traits to racial anatomy cannot be said to have resulted in anything definite. It may vaguely be affirmed that in the molars of the lower jaw, which are the more distinctive of the two, four cusps are more frequent in the "higher" and five in the "lower" races. This is the opinion of Dr. Topinard in his latest writings on the subject. He seems to have little respect for the lemurian theory, referring to these as "animaux de transition discordante, à type non arrêté."

Professor Topinard has taken up the subject with his usual thoroughness in an article seventy pages in length in *L'Anthropologie*, December, 1892, entitled "De l'Evolution des Molaires et Premolaires chez les Primates et en particulier chez l'Homme." In this he withdraws somewhat from the position he took in his *L'Homme dans la Nature* and concedes that the molars must be traced back, step by step, to lemurian forms; but claims that the fundamental types of the molars are identical in man and the anthropoids; that these latter belong to the monkeys; while man as he is at present constitutes a sub-order in the general order of Primates.

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THE ALPHABETS OF THE BERBERS.¹

BY D. G. BRINTON, M.D., LL.D.

THE Berber tribes are called by some writers collectively Hamites, and by others Proto-Semites. From the dawn of history they have occupied most of the area between the Nile Valley and the Atlantic Ocean north of the Soudan. They have, also, linguistic kinsfolk in Abyssinia and in adjacent parts of East Africa. The ancient Ethiopians were of their lineage; Timbuctoo was founded by one of their chieftains, and the extinct Guanches of the Canary Islands were members of their stock. To them belonged the classical Libyans, Numidians, Mauritians, and Getulians, and in later times petty tribes innumerable, the most prominent of which to-day are the Rifians of Morocco, the Kabyles of Algeria, the Touaregs or Tamachek of the Sahara, the Mzabis, etc.

During two short visits to North Africa in the years 1888 and 1889, I became much interested in the ethnology of this stock, which offers many most interesting problems. The one to which I shall confine myself at present is its methods of writing.

The Berber hordes of to-day, with one exception, employ the Arabic alphabet, though it fails to render some of the sounds with precision. The exception is that of the Touaregs of the Sahara. They employ an alphabet of their own, of great antiquity and disputed origin. They call it *tifnâr*, which is a plural from the singular *tafnek*. As in the Berber dialects, the radicals are single or small groups of consonants, invariable, and inflected by vowel changes, we have in *tafnêk* the quadriliteral radical *t-f-n-k*, as is held by Rinn; or, if the initial *t* be regarded as a neuter prefix, there will be the trilateral root *f-n-k*. The primitive meaning of this root is a sign, mark, or token by which a place or thing is recognized. Peculiarly-shaped stones or ridges, which serve as landmarks, are called *efnagha* (Barth).

Strictly speaking, the word *tifnâr* applies only to those letters of the alphabet which can be represented by straight lines; while a number of others, expressed by dots, receive the name *tidebakin* (Rinn). All letters, whether simple or compound, can be and usually are written by one or other of these methods, straight lines or dots, as is shown by the alphabet presented, from Hanoteau's *Grammaire Tamachek*. The cursive script, however, permits the use of curved variants in some cases, all of which are shown on the alphabet I submit.

The Touareg alphabet is far from systematic. The order in which the letters are arranged is purely arbitrary; there is considerable difference in the forms of letters in different tribes; there are no vowel-points like those in modern Hebrew, and no accessory signs to represent pure vowels. What is worse, there is no rule as to whether the script should be read from left to right or from right to left, from above downward or from below upward. The assertions made to the contrary by Hanoteau and Halévy are disproved by the documents published by Rinn, which

I show. They were written by native Touaregs to native Touaregs. The writer sometimes begins at a corner of the page, and proceeds from right to left or from left to right as he pleases; arrived at the further margin, he turns his sheet, so as to go perpendicularly or in any other way that suits him. As the words are frequently not separated, as punctuation and capital letters are unknown, and as the sequence of the lines is not fixed, it is no easy matter to decipher a Touareg manuscript. When a native undertakes the task, he begins by spelling the consonants aloud, in a chanting voice, applying to them successively the various vowels, until he finds the words which make sense (Hanoteau).

Imperfect as this alphabet seems, it is in very extensive use among the Touaregs, both men and women. Barth found that his young camel-driver could read it with ease. Captain Bissuel writes: "A de très rares exceptions, près tous les Touaregs de l'ouest, hommes et femmes, savent lire et écrire." Duveyrier makes a similar statement of the Touaregs of the north.

Most writers, one following the other, have traced the Touareg alphabet back to the Carthaginians, and have sought to identify its letters with those of the Punic writing.

Its history, however, is by no means so easy to unravel. That certain of its letters are identical with the Semitic alphabets is unquestioned; but some of them are not; and those that are alike, may they not be mere loans, or even independent derivatives, from some one common source?

The material to solve these problems must be drawn from ancient inscriptions. These are by no means lacking, and prove that an old Berber alphabet was in use in Northern Africa long before the Christian era; yes, in the opinion of some archaeologists, as Collignon and Rinn, long before the founding of Carthage.

These inscriptions are of two classes, the one carved on dressed stones, such as grave and memorial tablets; the other on native rocks, *in situ*, where a smooth surface offered a favorable exposure.

A large number of the former were copied and published by General Faïdherbe and have been studied by Professor Halévy. The latter explains most of the letters by the Punic alphabet, and presents transliterations and renderings of the epitaphs. His identifications, however, have not satisfied later students. I find, for instance, that while Halévy's "Essai d'Épigraphie Libyque" was published in 1875, René Basset, probably the most thorough Berber scholar living, writes in 1887 in his "Grammaire Kabyle": "Le déchiffrement de ces inscriptions est encore aujourd'hui sujet à contestation, au moins pour le valeur de plusieurs lettres."

This difficulty very much increases when we come to the other class of inscriptions — those engraved on the living rocks. The mortuary epitaphs collected by Faïdherbe may be referred with probability to a period two or three centuries before Christ; but the rupestrian writing is of much more uncertain age. Some of it has the patine and other attributes of high antiquity; in other instances it is evidently recent. Examples of it are found in abundance on both slopes of the Atlas range from Morocco to the Libyan Plateau. Unquestionable instances have been reported from the Canary Islands by Dr. Verneau; Barth found them south of Fezzan; Captain Bernard copied some in southern Algiers; last year M. Flamand described a number of stations in southern Oran; Dr. Hamy has made an instructive study of them; and a number of other travellers have added to our knowledge about them. They are often carefully and cleanly cut into the faces of hard rocks, and are thus calculated to resist the elements for many generations.

What is noteworthy about the oldest types of these rock-writings is this: that while they contain some letters which are common to the Touareg, Libyan, and Punic alphabets, they also present a certain number which are not, and which cannot be explained by them. Thus, in the most recent article on the subject, published last year in *L'Anthropologie*, M. Flamand writes that these glyphs show "bien caractérisées, des lettres Libyco-Berberes, et aussi des signes qu'il a été jusqu'ici impossible de comparer avec aucun de ces alphabets." The copies of

¹ Read at a meeting of the Oriental Club of Philadelphia, Feb. 9. (See *Science*, Nov. 18, 1892, p. 290.)

these inscriptions which I show will give an idea of some of these unknown signs. They are three in number, and fair examples of hundreds to be seen in the localities referred to. One was copied by Barth at a place southwest of Fezzan; the second by Captain Bernard, near Laghouat; the third by Captain Boucher, near Figuig. While each presents letters identical with some in the Touareg alphabet, or in the Numidian mortuary inscriptions, the majority of the letters belong to neither class.

It is the opinion of some careful students, therefore, and it seems evident, that for a portion of the ancient Libyan alphabet we must look elsewhere than to a Semitic source. The question is a new one; but there can scarcely be more than one answer to it. We must look directly to Egypt, whence the Semitic alphabets themselves must finally trace their origin. Nor does such an answer present the least historic difficulty. Earlier than the twelfth century, B.C., there were direct and much-travelled caravan routes from the heart of the Berber country into Egypt. "I have not the slightest doubt," writes Barth, "that the Imoshagh (Touaregs) are represented in the ancient sculptures of Egypt as the Tamhu and the Mashawash." We are well aware that thousands of Berber soldiers were enlisted in the Egyptian armies in the Ramesside epoch. The high culture they possessed is attested by the catalogue of spoils in the inscription of Merenptah. Unquestionably they became familiar with the various methods of writing in vogue in Egypt at that period.

In his latest work, Mr. Flinders Petrie maintains that the letters of the Phœnician alphabet were derived directly from Egypt; it is quite likely that one or more of the earliest Berber alphabets were also derived directly from the same venerable seat of culture, adopting, in part, signs identical, in part, diverse from the multiform Phœnician alphabets of the earliest epochs. Inter-course with the Semitic traders and colonists led to a greater or less unification of the methods of writing, as has occurred in so many other instances; so that the Libyan alphabet of the third century, B.C., was easily enough mistaken for a daughter, instead of a sister, of that in use by the Carthaginians. But they never reached a complete identity, and as the farther we go back, the greater seems the diversity, the theory of an independent origin appears to be alone that which will satisfy the facts in the case; and this theory has in itself a high historic probability.

The principal works to be consulted, copies of all of which from my own library I lay before you, are the following:—

Faidherbe, "Collection Complète des Inscriptions Numidiques."

Hanoteau, "Essai de Grammaire Kabyle."

Hanoteau, "Essai de Grammaire de la Langue Tamachek."

Halévy, "Essai d'Épigraphie Libyque."

Bissuel, "Les Touaregs de l'Ouest."

Basset, "Notes de Lexicographie Berbère."

Rinn, "Les Origines Berbères."

Numerous articles on the rupestrian inscriptions are scattered through the *Revue d'Ethnographie, L'Anthropologie*, etc. As the subject is one, I believe, entirely new to American Orientalists, and as it may possibly prove of considerable significance in the history of the development of Mediterranean civilization, this brief presentation of it will, I trust, lead to further researches.

LETTERS TO THE EDITOR.

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On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

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The Trinomial Question in Nomenclature.

I WOULD like to say just a word in relation to the article by Mr. C. Michener of San Francisco, which appeared in the Oct. 28 number of *Science*.

Whatever may be the views of others on this point, I maintain that there is an ethical side in nomenclature. My article was written largely from that point of view, the matter of "convenience" is of secondary importance.

When an author names and gives a recognizable description of a species, the latter becomes in a certain measure his individual property. (I feel safe in saying that this view is held by many others beside myself.) A later author who attempts to claim this species violates a law of ethics.

Mr. Michener's whole article hinges on this one point: Is there an ethical side in nomenclature? I leave my critics to answer this question. If there is, then the question arises: Shall justice be sacrificed to convenience?

Considering the matter of convenience, there is no point gained, in pursuing the course supported in the above article, which is important enough to warrant this violation of rights. Of the two evils, inconvenience and injustice, we should choose the lesser. We should put up with the inconvenience, which is at best slight. Taking the example cited: If H. and A. have described five species by the name of *malachroides*, then look each one up. It is safe to say that the necessity for doing this will not occur once in ten times. Again, let him who desires to find the characters of *H. malachroides*, H. and A., look at some later work, Greene's for instance, or any other. He will probably find, with little trouble, the genus *Hesperalcea*. If it is contained in some recent paper and he cannot find it, he is not conversant with the literature on the subject; and the sooner he becomes conversant, the better for his work.

The amount of truth which a name conveys depends entirely upon our understanding of what it represents. It is accepted by the majority of the scientific public (I refer especially to zoölogists) that the third term of the trinomial represents the founder of the species. If it were understood to represent the reviser who placed the species in its present generic position, of course Mr. Michener's argument would be valid. I know that the view here opposed is the one more generally held among botanists. But I believe it is growing in disapprobation. The opposite view is almost universally adopted by zoölogists, and is, I believe, the rational and just one.

C. H. TYLER TOWNSEND.

Agricultural College, Las Cruces, N. M., Nov. 5.

Notes on the Fauna of the Dry Regions.

IN *Science* for Dec. 23, 1892, my friend, Mr. A. Stephens, records an instance of a captive pocket-mouse (*Perognathus*) living for over two years without water or any food from which any amount of moisture could have been obtained; and, from the fact of water having been offered, it is plain that its abstinence was entirely voluntary.

That many birds and mammals inhabiting the desert regions of the southwest live for many months without any other moisture than that obtained from the food they eat, is well known to those who have studied zoölogy in these regions. And the study of the various sources from which the fauna of the arid plains of New Mexico and Arizona draws its supply of moisture offers a very inviting field.

In the low deserts of these territories rain seldom falls after March or before September. Often nine or ten months pass by without rain in sufficient quantities to form pools or streams where water could be obtained by the birds or mammals of these sandy wastes.

During the summer of 1886 I made my headquarters at a mining camp near the southwestern corner of New Mexico, in the midst of the dry regions. Water could only be obtained from a small spring ten miles west of camp, and no rain fell after my arrival, on Feb. 28, until some time about the last of August.

Birds and mammals were quite plentiful about my camp, many of the former nesting and raising broods of young, which reached maturity and, in some cases, migrated before they made the acquaintance of a drop of water.

In the case of the insectivorous species some moisture was obtained from their food, which was more or less juicy. But the sparrows and seed-eating species must have thought it a "long time between drinks," as their food was of the driest possible kind.

During the fall, after the various species of cacti had ripened their fruits, I frequently found them torn open by mocking-birds

and other species, but whether for the seeds or soft, juicy pulp I could not determine, possibly for both.

Many of the small mammals and rabbits were given to gnawing the inside from the various species of globular cacti, which furnished a large quantity of pulpy material, with plenty of moisture. Several large specimens of these cacti were found that were mere shells. The mice, having entered from below, and without disturbing the position or appearance of the plant, had carried away all but the thorns and woody exterior.

Deer and antelope were rather common on the plains below camp, and, as they were seen daily and some individuals recognized by certain peculiarities, it was plain that if they left the region in search of water, it was not often or for any length of time, but more probably that they drew a large part of their moisture from their food. The different species of cacti and agave were frequently found with large pieces bitten out of them by these animals. The latter plant especially seemed to supply them with a large part of the necessary moisture.

The Indians and Mexicans living in the arid portions of the peninsula of Lower California told me that the rabbits and quail of those regions did not breed during dry seasons, the latter remaining in flocks throughout the spring and summer. This statement was verified by my own observations in the spring of 1887. No young quail or rabbits were seen, though the adults were everywhere abundant.

This habit may extend to other species in this region, as young birds seemed to me to be remarkably rare during the dry season mentioned.

Whether this habit arises from the fear that suitable food for the young may be wanting or that water in larger quantities than is to be obtained would be necessary for their early existence, I am unable to say.

Off the west coast of the peninsula, between 28° and 29° north latitude, are two islands — Cerros and Guadalupe — both of which are inhabited by large herds of wild goats, the descendants of domestic animals placed there by the whalers for the benefit of shipwrecked sailors; there are also quite a number of deer on Cerros.

On both of these islands water is found in small quantities. But during dry seasons this becomes so scarce that the large herds of Guadalupe especially suffer considerably. The sealers of that coast told me, however, that during seasons of little rain the goats drank sea-water and managed to exist until better times. This story was looked upon as a sailor's yarn, without foundation, until endorsed, in part at least, by my brother, who returned from a trip along the coast of the peninsula in June, 1892.

Goats were found on Natividad Island, a small island south of Cerros, which is known to contain no fresh water. As they were out of fresh meat, a few were shot for use on board the schooner, and a kid about one-third grown was captured and taken on board as a pet. Fresh water was offered it, supposing it would be a very acceptable variation to its fare of dry weeds; but, strange to say, after the first sip, it shook its head in disgust, and turned away. Sea-water, however, was accepted and regularly drunk. Gradually it formed a liking for fresh water, and at the end of a month would not pay any attention to salt water. That goats are rather scarce on Natividad would indicate that they did not thrive on sea-water; yet those that were killed by my brother were fat and in every way in good condition.

The story that prairie-dogs have in each colony one or more burrows reaching to water has been widely spread and is probably not without foundation; but that such is the case wherever prairie-dogs are found is by no means true. I witnessed the sinking of a well in southwestern New Mexico, in the midst of a very large colony of these rodents, the supposition being that, where "dogs" were so abundant, water could not be far from the surface. After a depth of over two hundred feet had been reached, the work was given up and the bottom reported as the dryest spot in New Mexico. In sinking to this depth, several strata of tough, slaty clay were cut that would have undoubtedly proved an impassable barrier to any burrowing rodent, had it even penetrated to that depth.

Prairie-dogs are undoubtedly fond of water when it can be

obtained. I have frequently, in Colorado, found their colonies near streams, to which well-beaten trails led, and where large numbers were seen drinking daily. But where water is not to be obtained, they seem to be able to subsist upon what moisture they can get from the dry, scanty vegetation of the arid regions in which they live.

A. W. ANTHONY.

Denver, Colo., Feb. 7.

Bad-Air Indicator.

PERMIT me to suggest, through your columns, something desirable to be invented if it be within the limits of science to produce it, namely, an automatic and reliable indicator of bad air. I do not in the least know whether such a thing can be made, and must admit that the only chemist to whom I have proposed the matter sees no way to construct it, but it is possible that some one might see his way clear to it. My idea is to have a plain circular disc, which might be made ornamental, which should be one or two feet in diameter, which should be placed on the walls of a room or hall, and the surface of which should be pure white when the air of the room is reasonably pure, but which should become discolored by the presence of bad air, and the color of which should deepen or darken in proportion as the impurity in the air increased. It seems to me that such an indicator, plainly making its announcement before the eyes of all, would be valuable. It may be said that our sensations are sufficient indicators of the presence of foul air, but this, I think, is not so, and the vitiation of the air in many a hall is so gradual and insidious that the great number of people may, without knowing it, be gradually forced to breath air which is most poisonous, and nearly every particle of which — to state the matter plainly — has been previously many times breathed into and out of other people's lungs. Cannot some substance or surface be so chemically prepared as to give this, the above-mentioned, indication? Is not here a good chance for the chemist and inventor?

C. H. AMES.

Boston, Mass, Feb. 10.

On Chelydra serpentina.

THE snapping tortoise is not one that appeals to many as an animal of which to make an attractive pet. His appearance and his manner of receiving advances are decidedly against improvement of a reputation that contains little of the good. There is a widespread opinion that he is quite intractable, utterly savage and ferocious, and without redeeming traits. My own ideas on the subject, however, have been greatly modified by the behavior of a seventeen-inch specimen kept in a tank in a corner of one of the rooms in this museum, where he furnished a good deal of entertainment for visitors, during the summer and autumn of last year. The sulkiness brought with him gradually vanished until he began to take food from long forceps; later he would accept meat from the fingers; and still later would come out of the tank for something to eat. Eventually he gained confidence enough to traverse a forty-foot room for a sparrow, a mouse, or a snake that might be offered. He seized the food held out for him in his jaws, turning his head to one side, if necessary, to do so with advantage, then he turned himself about and, high on his legs, like a little elephant, with the hinder inch or two of his tail bearing on the floor, marched gravely back to his miniature pond. Sometimes the fur or feathers of prey stood up or covered his eyes so as to prevent seeing distinctly. No matter, the jaws never loosened their grip and their owner blundered along banging against anything in the way till from one side or the other he at last managed to get into the water. Wherever food was given him, his only place to eat it was under the surface in his tank. Firmly held between the jaws whatever he wished to eat was torn in pieces by the claws of his fore feet, or, if too tough for tearing, it was at least reduced to such shape as admitted of swallowing entire. After a time "Snap," as he was named, became rather too familiar, coming out of his retreat at all times, whether called or not, whenever one entered the room. If a student came in and took a seat at a table, Snap was pretty sure to plant himself under the chair or at the feet of the newcomer to remain for an hour, more or less, as pleased him. Pushed aside,

he either lay quiet or rose and stalked back to his own corner as if offended. Some might take it that his conduct indicated a fondness for company, or the possession of grateful feelings, or even an affectionate disposition; but it is not necessary in explanation of Snap's deportment to go beyond his desire for food. In the satisfaction of his hunger his interest in human beings departed. His doings are here put forward in support of nothing except that with proper treatment the snapping tortoise, one of the lowest and least likely of the tortoises, may lose his timidity, his ferocity disappearing in consequence, and become susceptible of a considerable amount of training.

S. GARMAN.

Mus. Comp. Zool., Cambridge, Mass.

Snow Rollers.

THE article of Dr. Claypole, in *Science* No. 522, on "Snow Rollers," recalls what I saw a few years ago. The condition was like that described by Mr. Hart. There was a smooth crust of snow on which a light fall of damp snow fell. The wind changed suddenly to the north, blew hard, and I saw scores and perhaps hundreds of these snow rollers forming. The wind simply blew them along and they formed just as boys roll snowballs. I feel sure such occurrences are not uncommon here. These rollers were several inches in diameter.

D. S. KELLOGG.

Plattsburgh, N. Y., Feb. 9.

The Antiquity of Man.

IN "Current Notes on Anthropology.—xxii." (*Science*, Feb. 10, 1893), Dr. Brinton has referred to certain discussions that took place at the meeting of the German Anthropological Association last August. Not having yet seen the report of that meeting, I cannot judge how far Dr. Brinton may have been misled by his authorities, but I wish to enter a decided protest as to two statements made by him. Let me premise by saying that it seems to me that it behooves Americans to maintain a strict neutrality in the international jealousies between the Germans and the French.

In regard to the importance to be attached to the celebrated "Neanderthal skull," it seems to be sufficient that it has been adopted by De Quatrefages and Hamy to set all the Germans, except Schaffhausen, against it. I did not expect, however, to find an American using such language as this about it: "The Neanderthal skull . . . was not dug up at all, but was picked up in a gully, which had been washed in the mountain side, and came from dear knows where. Probably there had been an old graveyard further up the hill, but by no means one in quaternary times." I will quote the exact language of Dr. Fuhlrott, the discoverer, describing the circumstances under which it came to light. "In a wild ravine, called the Neanderthal, cleft in the Devonian limestone, is a small cavern, about eleven feet long, ten broad, and eight high, opening upon an almost vertical wall of rock about sixty feet above the level of the stream [flowing through it]. . . . The ravine has been quarried for marble. In the cavern is a bed of clay, a glacial deposit, almost as hard as stone. In this clay, at a depth of two feet, in August, 1856, a human skeleton was discovered," etc. (Hamy, "Précis de Paléontologie Humaine," p. 237). The real question in regard to these human remains is, in the words of Schaffhausen, "Whether the cavern in which they were found, unaccompanied with any trace of human art, were the place of their interment, or whether, like the bones of extinct animals elsewhere, they had been washed into it" (*Natural History Review*, 1861, p. 172). In all serious discussions it is well to stick close to the facts of the case.

The other subject, about which I dissent from Dr. Brinton's conclusions, is in regard to what he calls "the delineation of a mammoth on a bone from the Lena cave in the south of France. This was not discussed, being probably considered of questionable origin." I must own that at first I was somewhat puzzled to know just what Dr. Brinton meant by "the Lena cave in the south of France." But on looking into the recently published English translation of the Marquis de Nadaillac's "Prehistoric Peoples," p. 119, Fig. 38, sure enough, I found an engraving representing a "Mammoth or elephant from the Lena cave." Now this remarkable designation is not due to the author, who calls it

a "Mammoth ou elephant de la Lena," referring to the well-known discovery in 1799 of the body of a mammoth, imbedded in the frozen banks of the river Lena, in Siberia. I suppose that scarcely any relic of antiquity is better known to pre-historic archaeologists than the remarkable delineation of a mammoth upon a plate of fossil ivory, discovered by Edward Lastet, in May, 1864, in the cavern of the Madelaine (Dordogne), in southern France. It was made in the immediate presence of M. de Verneuil and of Dr. Falconer, and an account of the circumstances of the discovery was given by him in a letter to Milne Edwards, published in the *Annales des Sciences Naturelles*, 5e. ser., T. iv. (Zool.), 1865, pp. 353-356. That even international jealousy should "question its origin" surpasses belief.

HENRY W. HAYNES.

Boston, Feb. 16.

Birds in Severe Cold Weather.

DURING the recent severe cold weather, as one of the high-school students was on his way through the belfry of the building to hoist the weather signals, he discovered a small bronze owl perched above one of the windows. It had evidently been drawn thither by the heat from the chimneys and pigeons which frequent the ventilators. On being captured by the janitor, on the day following, the bird made no resistance. It was put into a cage, to be kept for the zoölogy class. It lived but one brief day, and it was found to be emaciated and evidently died of weakness and sheer exhaustion. The taxidermist who stuffed it said that it was only one of a large number recently brought to him as victims of the cold spell. Many were found frozen in barns, and had been driven by the cold from the woods to the city.

Large numbers of snow-birds, crows, as well as English sparrows, were hovering about grain elevators, the glass works, and other similar buildings for warmth and food all through the cold period. The gathering of birds about warm chimneys, etc., in such large numbers was something unusual.

E. R. WHITNEY.

Binghamton, N. Y.

Miocene Group of Alabama.

SINCE sending you a contribution on the Miocene Group of Alabama, Dr. Wm. Dall of the Smithsonian, to whom the fossils collected had been submitted, has returned his report, naming the most of them and declaring his opinion, that they are rather of the older than a younger Miocene. This will better suit the geographical position and other facts detailed of the Grand Gulf. His final determination will be published in the Alabama Report.

LAWRENCE C. JOHNSON.

Meridian, Miss., Feb. 13.

Mule-footed Hogs.

MR. J. F. RITTER of Higginsville, Mo., sends me a hog's foot, which to me is something new. It has the two larger hoofs united into one. The bones above are separate but the hoofs wholly united. He states that a farmer of the vicinity has a drove of these mule-footed hogs. By crossing breeds he has some with two cloven feet and two mule feet. I should like to know whether this is a common occurrence, or is it something new?

JNO. H. FRICK.

Warrenton, Mo., Feb. 11.

BOOK-REVIEWS.

A Manual of Bacteriology. By GEORGE M. STERNBERG, M.D. New York, William Wood & Co. 886 p. 8°. \$7.

THE results of the bacteriological investigation of the past decade, when massed in a huge volume like the one before us, are calculated to arouse the keenest admiration for the talent and industry that have produced them. Even in this period of breakneck *temps* in all lines of human activity and thought the progress of bacteriology seems to the world at large truly marvellous. Every year, we may almost say every month, witnesses some discovery of untold practical value. If a last word had

been needed to convince the "practical man" of the ultimate advantage to the race of "pure" science and "pure" investigation that word would have been added in these latter days by the development of the science of bacteriology. To have given to the world for the first time a rational theory of infectious disease, and to have indicated the therapeutic possibilities of the future are achievements that may well make the last quarter of the nineteenth century memorable in the history of human progress.

It is eminently fitting that Dr. Sternberg, who has himself done much to increase our knowledge of bacteriology, and who was one of the pioneers in the work in this country, should give to the English-reading public their first adequate survey of the bacteriological field. His manual at once takes its place as the standard bacteriology in the English language.

The bulky volume of 886 pages is divided into four parts, the first treating of classification, morphology, and general bacteriological technology; the second of general biological character; the third of pathogenic bacteria, and the fourth of saprophytes. An invaluable bibliography, covering over 100 pages, and an index conclude the volume. The press-work is on the whole excellent, but we must enter our protest against the thickness of the paper used. A thinner paper would have given even greater satisfaction to the eye, while its use would have considerably reduced the awkward size of the book. The use of needlessly thick paper, however, is so common a failing of American book-makers that it is perhaps hypercritical to bring it up in this instance. The plates and text figures are executed in an unusually satisfactory manner, and the photomicrographs are of the high degree of excellence to be expected from one as expert in the technique of photomicrography as the author of this book.

Among the most timely and practical portions of the manual may be mentioned the chapters on antiseptics and disinfectants, the influence of physical agents upon bacteria, the practical direction for disinfection, etc. Lengthy quotation is made from the Report of the Committee on Disinfectants appointed by the American Public Health Association, principally to keep before the public the high merit of chloride of lime as a ready and reliable disinfectant. Reference is made, also, to the use of fresh bread for rubbing down the walls of an infected apartment. This method is based on experiments of Esmarch, which seem to indicate that this is the most reliable way of removing bacteria from the walls and ceilings of infected rooms.

A long and studied chapter is devoted to the consideration of the vital questions of susceptibility and immunity. Dr. Sternberg, while disposed to accord to phagocytosis an important rôle in some diseases, is profoundly impressed — as are most bacteriologists — by the remarkable evidence adduced during the last few years in support of the "anti-toxine" theory. It is becoming more and more probable that Metschnikoff's brilliant phagocyte theory embodies at most only a partial explanation of the facts of immunity. "The experimental evidence detailed," says Dr. Sternberg, "gives strong support to the view that *acquired immunity depends upon the formation of anti-toxines in the bodies of immune animals.*"

The sections devoted to the description of such bacteria as have a recognized pathogenic significance are compiled with the fullest reference to recent investigations. Some students may, however, wish that the wealth of material had been more critically arranged and more exhaustively indexed.

A great boon to the student of bacteria from the botanical and systematic side will be the descriptions of the common bacteria of air, water, and soil. Only those who have attempted to compare and identify forms encountered in every-day experience are aware of the labor involved in the compilation of these data. Dr. Sternberg's work ought to give a strong impetus to the movement to bring order out of the existing chaos of vague "species" and vaguer "forms."

As is well-nigh inevitable in a book covering so much ground — and ground, too, that is shifting under one's feet — various errors of omission and commission are apparent. In the first place, it is evident that the index to a work of such magnitude should be thoroughgoing and should not shrink from numerous cross-references. The fact that the index before us contains

under the heading "Cholera" no reference to the pages dealing with Asiatic cholera (pp. 500-509), a topic which at present is always with us, indicates opportunities for expansion. The reader who turns the pages and sees something about "alexines" (p. 261) and something about "splenic fever" (p. 327) will find in the index no entry under either of these heads.

Among oversights in proof-reading may be mentioned the substitution of "Chamberlain" for "Chamberland" (pp. 57-59), the use of "aerobic" and "anaerobic" for the more usual nouns "aerobe" and "anaerobe" (pp. 78-83), "micrography" for "micrographie" (p. 8), etc. On page 237 is a singularly involved translation from a memoir by Pasteur. The following sentences fairly represent the style: "The fowls are then in the constitutional state of fowls not subject to be attacked by the disease. These last are as if vaccinated from birth for this malady, because the foetal evolution has not introduced into their bodies the material necessary to support the life of the microbe, or these nutritive materials have disappeared at an early age."

These blemishes, however, do not seriously mar the general excellence of the manual. It is to be hoped that Dr. Sternberg may see his way clear to the preparation of successive editions of this valuable work. In a science that is advancing so rapidly as bacteriology, new facts are constantly coming to light and compelling frequent revision of our views. Dr. Sternberg has brought the present volume well up to the latest researches and thus encourages us to hope for a second edition as soon as the progress of bacteriology shall demand it.

Discussion of the Precision of Measurements. By SILAS W. HOLMAN, S.B. New York, John Wiley & Sons, 1892. 176 p. 8°. \$2.

PROFESSOR HOLMAN, perhaps even more than the average physicist of experience in experimental work, has made a specialty of the science of exact measurements. His work, like that of Dr. A. M. Mayer and of Dr. Rowland, has involved, more than is common, the application of refined methods of determinations of quantity to the investigation of those insensible physical phenomena which ordinary modes of measurement are incompetent even to reveal; methods formerly little known or practised in this country, but now familiar to the younger physicists through the work of these leaders in this department of research. In the volume before us are collected a series of articles originally prepared for the *Technology Quarterly* and *Electrical Engineer*, revised and given more complete and formal shape for permanent preservation, and for the use of students and their instructors, both in pure physics and in the applied science of the engineer. These studies are valuable, not only as giving useful knowledge and power of accomplishment of professional work, but as stimulating the young aspirant for learning and reputation and giving him an attitude of mind in itself desirable and fruitful of good result. As remarked by its author, "An experimental result whose reliability is unknown is nearly worthless. The grade of accuracy of a measurement must be adapted to the purpose for which the result is desired. The necessary accuracy must be secured with the least possible expenditure of labor. These statements apply no less to the roughest than to the most elaborate work which the engineer is called upon to perform; they are no more true of refined scientific research than of ever-day engineering and industrial practice." The book is thus of especial value to both classes, whose methods, indeed, are daily becoming more and more alike in their refinements, and in their purposes and applications. In modern researches, especially, in the development of the phenomena underlying the operation of the steam-engine, in the construction of the dynamo-electric machine, in the transfer and transformation of energies, of whatever kind, the contemporary engineer and physicist are working together, and sometimes each doing important work in the special field reserved to the other. Especially is this the fact in electrical physics, in which branch the department of pure science occupied by the physicist and that of applied science which constitutes engineering, blend insensibly, and their work is performed, within a large area of boundary territory, by members of both professions alike. The electrician is sometimes confounded with the electrical engi-

neer, and the reverse. But whether the reader is proposing to work in the department of science or in that of construction, Dr. Holman's work will prove a most useful and instructive aid. Direct measurements and the theory of errors, the method of least squares and the establishment of criteria, indirect measurements and the best ways of planning their applications, estimates of precision and approximation in the solutions of the most important problems, illustrations of good work, with instructions for special cases, as for calibration of instruments, measurements of efficiency, and other similar matter, make the book one which the engineer and the physicist alike will find valuable, and they may place beside Kohlrausch as an authority, and as a useful supplement, if not a substitute, to that standard work.

The work of the publishers is, as usual, well done. We notice the imprint of Drummond, as its compositor and electrotypist, and take it to be an assurance of careful work in composition, and especially in the mathematical portion of the work. Supplementing the proof-reading of so accurate an author, it gives comforting assurance of freedom from those usually too frequent errors which annoy the reader of the first edition of a work of this kind.

Seventh Annual Report of the State Board of Health of the State of Maine, 1891. 399 p. 8°.

By far the greater part of this report is devoted to the consideration of school hygiene and school-houses in a paper by Dr. A. G. Young, secretary of the Board. This interesting compilation should prove of value in stimulating reform in school methods and school buildings. It clearly and forcibly presents those fundamental principles of individual and public hygiene about which there is substantial agreement among sanitarians. It is humiliating to have to believe that too often those having immediate charge of such matters either disregard these principles or are ignorant of them altogether. Reform can be brought about only by adding line to line and precept to precept.

In the reports of the local boards of health it is observable that cases of typhoid fever occur with ominous frequency in the reports of the small towns where well-water is used for drinking.

The Mound Builders, Their Works and Relics. By Rev. STEPHEN D. PEET, Ph.D. Vol. I. Chicago, Office of the American Antiquarian, 1892. 376 p. 8°.

It appears from the preface that this is the first of a proposed series of five volumes relating to the ancient history of the area of the United States. The author is well known to students of that branch as the founder and editor of the *American Antiquarian*, a specialist's journal, which has survived for many years, and is a repository of much valuable information.

In several respects Dr. Peet's opinions about the mound-builders differ from those current in Washington or Boston. To him, "There was a mound builders' age in this country as distinctive as the Neolithic age in Europe" (p. 31). This age "began some time after the glacial period and ended about the time of the advent of the white man" (p. 34). Geographically, he limits them to the Mississippi Valley, but nevertheless attributes to them the mica mines of South Carolina, the shell-heaps of Florida, and the rock-inscriptions wherever found. He is not in sympathy with the theory that the mound-builders were the ancestors of any of the natives met by the early explorers, but believes they had a civilization and a religion of their own, not to be identified with those of the Redskins of later date. He thinks it likely that the much-discussed "elephant pipe" and "Davenport tablet" attest their knowledge of alphabetic signs and their familiarity with the mammoth and the mastodon; and perhaps he is not wrong when he asserts of these relics (p. 47), "The evidence in their favor is certainly as reliable as that which has reference to the rude stone relics which have been described in Wright's 'Ice Age.'" He himself is not quite convinced that there were any palæolithic people in the Mississippi Valley,—in which he is in accord with some very recent debaters of that question. He says (p. 36): "We imagine that the mound-builders were the first people who occupied the territory after the close of the glacial period." Whence they came he answers as follows: "The same race that built up the

ancient cities of Mexico pushed eastward and colonized the Mississippi Valley" (p. 112).

Having solved to his satisfaction these questions, Dr. Peet proceeds to describe at length, and in part from personal observation, many of the mounds, enclosures, earthworks, implements, ornaments, and other relics which he attributes to this mysterious people. He devotes chapters to their religions, their "water cult," their "solar cult," their symbolism, and their sacrificial rites.

Much of the work, most of it, we believe, has already appeared in the pages of the *American Antiquarian*; but those who sympathize with the opinions of the author will doubtless be pleased to have his contributions collected into a convenient form. He is unquestionably an earnest and honest student of the facts before him, and the conclusions he reaches should, therefore, receive careful consideration.

Some Strange Corners of our Country: The Wonderland of the Southwest. By CHAS. F. LUMMIS. New York, The Century Co. 270 p. Illustrated. 12°.

FOR those readers who have read but a few books of travel on the Southwest, this snug little volume will be quite a revelation. The contents of the twenty-two chapters scarcely contain anything that has been written or sketched before, except a few pages on the Moqui snake dance and Indian superstitions. The thoroughness of his familiarity with Pueblo customs and folk-lore is only equalled by the graphic qualities of his style. In looking about "the strange corners" which the author describes, we are first attracted by a prairie-dog hunt, to which the Navajo Indians resort to fill their larder. White people of the Southwest never think of killing this rodent for food, because it is so difficult to attain with a rifle-ball; but these natives utilize abundant downpours of rain to conduct the floods into their tunnels, and afterwards haul up their dead bodies for a feast. To get rid of the prairie-dog plague, people have proposed to kill them with poisoned apple-quarters. The belief in witchcraft is as potent among the whites and Indians of New Mexico as it ever was during the Middle Ages. Man-slaughter is committed for any act arousing even the suspicion of witchery, and the fact that one-half of the Isleta people are wizards and witches speaks loudly enough. The "finishing an Indian boy" shows principles of education in full force now, which our northern Indians began to drop as early as a century ago. In the chapter, "The American Sahara," the wide waste is delineated in colors none too sharp or cruel. Lieutenant Wheeler is mentioned by mistake as its earliest explorer instead of Lieutenant Whipple. The marvellous wealth of objects presented in Lummis's volume will attract ever and again the class of readers and tourists which seeks instruction rather than pleasure in books of travel, and they will hold it dear as a publication of really scientific value, standing far above most of the productions of our present sensation-loving period of literature.

"The Wanderings of Cochiti" is another very interesting sketch from our "Wonderland" on the upper Rio Grande. It is printed in the *Century Magazine*, January, 1893, and describes and also pictures in photographic reproductions the people, customs, history, and scenery of Cochiti, one of the Quéres pueblos of northern New Mexico and the celebrated gorge of Tyu-on-yi and its rock-carvings in the vicinity of that pueblo. The scene of Banelier's archæologic novel, "The Delight-Makers," is placed in that locality.

First Steps in Etruscan. By F. W. NEWMAN. London, 1892.
The Etrusco Libyan Elements in the Song of the Arval Brethren. By D. G. BRINTON. Philadelphia, 1893.

THESE two pamphlets are the latest contributions to the study of the Etruscan problem. The first is written by the eminent and venerable emeritus professor of University College, London, now close to ninety years of age. It is worth while to find a man willing to take "first steps" in any branch of learning at that time of life. The questions he examines are: By what route came the Etruscans into Italy? He inclines to believe that they came by sea from Asia Minor, and not across the Alps from the northwest, as Taylor teaches. The Etruscan alphabet he con-

siders far older than the Lycian. The Etruscan numerals on the celebrated Toscanelli dice he reads: 1, *mach*; 2, *ki*; 3, *zal*; 4, *sa*; 5, *thu*; 6, *huth*; agreeing in this with Taylor, but at variance with Professor Sayce, who, in the *Academy*, Oct. 15, 1892, prefers the following sequence: *makh*, *huth*, *sa*, *ki*, *thu*, *zal*. Professor Newman does not think the Etruscan language either Aryan or Semitic, but does not proceed farther in its identification, indulging himself in this connection with the following comment on the procedures of another Etruscan student: "Mr. Isaac Taylor treats all languages outside of these two systems as if so specially allied, that he may at pleasure interpret the vocables of any one from any other, and this however different the ages of the two." Other subjects treated are Etruscan concord, words for bronze and brass, attempted translations of epitaphs, the meaning of *kle* and *kal*, etc. Most of this he frankly calls "guessing"; but it is guessing by a method.

The second pamphlet is a reprint from the Proceedings of the American Philosophical Society. Dr. Brinton has published various papers intended to show some ethnic affinity or cultural connection between the Etruscans and the Libyans. Here he takes up the venerable song of the Fratres Arvales — probably the oldest literary monument of Roman antiquity — and seeks to show the indications it presents of a connection with the Berber religions of North Africa. Of course, much of his argument turns on the third line of the song:

Satur fufere Mars limen sali sta Berber;

for which he accepts the rendering of Professor Michel Bréal:

Sata tutere, Mars; clemens satis esto, Berber.

Berber, he points out, is but the reduplication of Ver or Ber, whom Varro mentions as the chief divinity of the Etruscans; a deity who under the same name occupied the same position in the Libyan pantheon, and from whom the name Berber is derived, as well as the word Africa (A-fer-ica). The coincidence, if it is nothing more, is a most curious one, and it would certainly

seem that the Etruscans borrowed their gods from Africa, if they did not come from there themselves.

Theory of Structures and of Strength of Materials. By HENRY T. BOVEY. New York, J. Wiley & Sons, 1893. 817 p. 8°. \$7.50.

CANADIAN authors have been neither numerous nor productive, hitherto, and especially in the fields of science. Sir John Dawson and the able men of the Dominion Surveys, in science, and Goldwin Smith, in history, nevertheless, have led a small body of able men in the performance of work which is most creditable to that now practically independent nation. The appearance of a new work by a Canadian writer, especially in the department of applied science, is thus a somewhat important event; and the volume here offered us will receive a hearty and appreciative welcome by all who are familiar with the standing and ability of its author, and with the work accomplished by him, both professionally and in the development of technical education in his own country. The work itself is an extension, with revision, of the smaller work on Applied Mechanics issued by its author some years ago. It has the form usually considered appropriate to a work of its kind, intended for the use of classes in engineering, in the higher class of schools, such as that of McGill University with which Professor Bovey is connected. It treats of framed structures, their stresses and strains, and their materials, of earthwork and retaining walls, of friction, and of the various forms of bridges and other constructions of the engineer and the architect. The book gives more of modern and exact data than is usual in works of this sort, written, as they are apt to be, by writers drawing upon literature, rather than recent research, for their facts and principles, and unfamiliar, through practical experience, with the actual work of the profession which they assume to instruct. We find here the records of the latest investigations relative to the strength and working qualities of materials, the laws of friction, solid, fluid, and "mediate," and investigations of the direction and magnitude of stresses in the mem-

CALENDAR OF SOCIETIES.

New York Academy of Sciences.

Feb. 27.—H. Carrington Bolton, Progress of Chemistry since the Fifteenth Century, B.C., as Depicted in Apparatus and Laboratories.

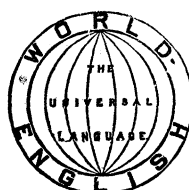
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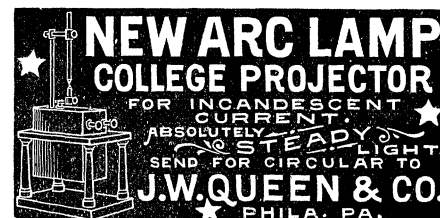
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bers of structures variously strained. Rankine's unique studies, and the graphics of that author and of continental writers, find illustration and useful application in intelligible and practically available shape; and the methods of connection of parts in practical construction are given in a form likely to meet the approval of the practitioner, as well as of the learner. Tables of constants for use in connection with computations of proportions of parts, and good illustrations, are distributed throughout the book. The work is somewhat extensive, even for students in engineering schools, and will prove valuable for office use as well as in the classroom. We observe that it is dedicated to Mr. Wm. McDonald, the generous donor of the new engineering buildings and equipment of McGill University; a graceful and well-deserved compliment to a man who has done more, perhaps, than any other citizen of Canada to promote this essential element of modern progress in his native State. The composition and printing are excellent; but the paper is thin, probably designedly so, in view of the fact that the volume is a bulky one at best. The book is well worth its price.

AMONG THE PUBLISHERS.

THE Century Co. is about to publish "A Handbook of Invalid Cooking," by Mary A. Boland, instructor in cooking in the Johns Hopkins Hospital Training-School for Nurses. The book is intended not only for nurses in training-schools and private practice, but for all who care for the sick. Besides recipes, menus, suggestions for the proper feeding of children, etc., a part of the book is devoted to "Explanatory Lessons," wherein the various food principles are described, with chapters on Nutrition, Digestion, Chemical Changes in Food, etc.

—J. J. Audubon, the great naturalist, wrote, many years ago, the story of his youth for his children. It was found accidentally in an old volume where it had long been hidden, and is to be printed for the first time in its entirety in *Scribner's Magazine*

for March. The youth of Audubon was most romantic, and at times exciting, and his story of it is told with an ingenuous charm which makes it as interesting as a novel.

—Professor Henry Drummond will deliver the Lowell lectures at Boston this spring. The subject will be "The Evolution of Man." Professor Drummond has not yet decided as to the date of the publication of these lectures, but has taken steps to protect his copyright in America.

—Professor William Holms Chambers Bartlett, the author of "Treatise on Optics" (New York, 1839), "Synthetical Mechanics" (1850), "Analytical Mechanics" (1853), and "Spherical Astronomy" (1855), died at his home in Yonkers, N.Y., on the 11th of February, aged eighty-nine.

—Instances of the recognition of the claims of science by the general press are always worth chronicling. It is therefore not without interest that we notice that the *Queenslander* (a Brisbane weekly) is issuing a series of extended descriptive articles on the Butterflies of Queensland, the work of an entomologist writing under the *nom de plume* of "Aurelia." This, we believe, is the first attempt to accomplish a connected account of Australian Rhopalocera, and, as Queensland contains by far the larger proportion of the species inhabiting the Australian sub-regions, these contributions to science are of especial significance.

—Charles Scribner's Sons are preparing a novel and interesting contribution to the World's Fair in the form of an "Exhibition Number" of *Scribner's Magazine* to be published simultaneously with the opening of the Exposition at Chicago. It is not proposed that the text shall relate chiefly to the Fair, but, on the contrary, the leading writers and artists have been asked to contribute to the number what they themselves think will best represent them. The pages of text and illustration will be largely increased, and the appearance of the number is likely to be looked for with eagerness by all readers interested in the work of American magazines.

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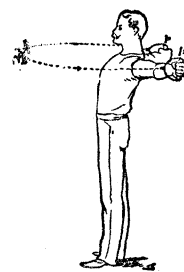
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